and tropical East Africa have reciprocating currents, while the south coast of Australia receives drift from South Africa and southern South America. Similarly southeastern Australian drift would tend to reach the north end of New Zealand. If the data were only sufficient for the construction of accurate paleogeographical maps for those times of land extension during the Tertiary and Quaternary and if the ocean currents could then be plotted upon these, doubtless much light would be shed on many anomalies of distribution.

Work like that of Guppy, interesting and important as it undoubtedly is, can hardly be said to furnish more than analogies and a basis for theory, since the distribution of most of the orders of plants was a much more ancient process, and unless we are prepared to subscribe to similar continental outlines, climates and ocean currents during the Tertiary, all three assumptions which are negatived by what we already know of geological history, we have many other factors than are furnished by existing conditions which must be taken into account.

The chapters headed Differentiation and Distribution are eminently sound in principle and should give plant geographers much food for thought. It is a great pity that in this connection the author seems to be unfamiliar with considerable recent American literature on this subject.

A special chapter is devoted to the distribution of *Sphagnum* and *Carex*, and the Azores occupy the three concluding chapters, while an appendix contains over fifty additional pages of valuable matter.

The book is well written and well printed and is a mine of information which is illuminated throughout with ideas, and it should find a place in every well-equipped library.

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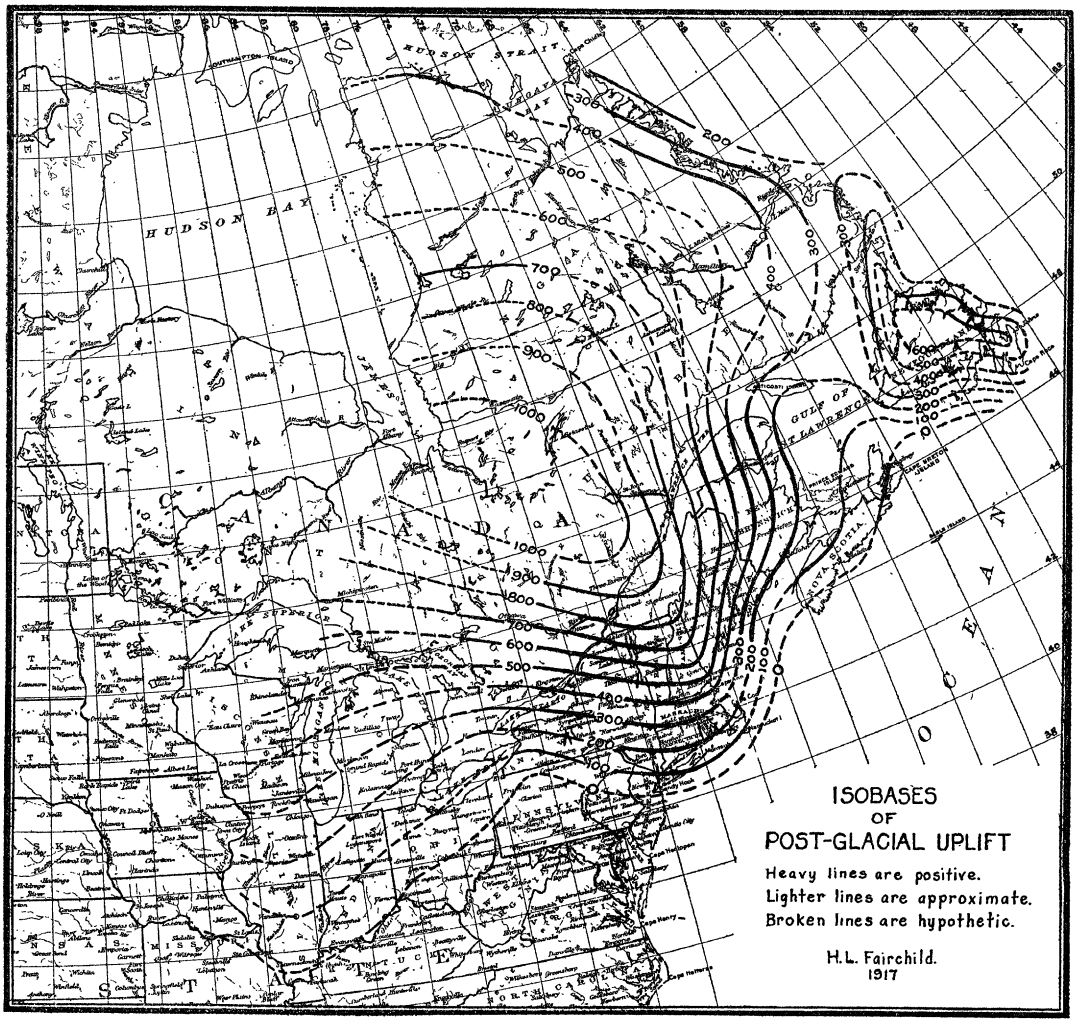
SPECIAL ARTICLES

POST-GLACIAL CONTINENTAL UPLIFT

THE rise and fall of great areas of the earth's surface (diastrophism) is one of the most certain facts of human observation. Isostacy, the general equilibrium or balancing of pressures within the earth's "crust," is recognized as a fundamental principle of geophysics. The crust of the earth is sensitive to unbalanced pressures, the loading and unloading of different areas. It is, therefore, reasonable to suppose that the weighting of large areas of northern lands in Pleistocene time by the accumulation of vast continental glaciers, one or two miles in depth, would produce subsidence; and that the return of the ice caps to the sea would cause uprising of the depressed areas.

Whatever may be the opinion of the student of geophysics regarding the effect of the Pleistocene ice caps on diastrophic land movement, yet the fact is certain that the area covered by the latest North American ice sheet, the Labradorian glacier, stood much beneath its present position, relative to sea level, when the ice sheet melted off; and that a recent slow uplift has brought the land to its present attitude. The proof of this Post-Glacial uplift is the occurrence of many high-level beaches and sandplains facing the open sea, and extending far up the valleys in Canada, New England and New York, with the occurrence of abundant marine fossils hundreds of feet above the ocean. These facts have been recognized for nearly a century, and a great number of observations are on record in Canadian and American geological literature. Yet up to the present time the full vertical amount of submergence, or the subsequent uplift, and the extent or limits of the affected area have not been determined beyond dispute. The total amount of the down-and-up movement has nearly always been underestimated, for the reason that the conspicuous or more evident marine features are of inferior and later levels, while the initial and summit shore features are commonly weak and unobtrusive, or they lie so far inland and are so detached as to be unrecognized, or their origin and relationship misinterpreted; usually being referred to glacial agency. Yet the summit or initial level at any locality is the one critical and essential element in the diastrophic problem.



The determination in recent years of the upraised marine plane throughout the Hudson-Champlain and Connecticut valleys afforded a good base line for more extended exploration.[1]

During the summer of 1917, with financial aid from the research fund of the American Association for the Advancement of Science, the writer has been able to determine with precision, or with close approximation, the amount of Post-Glacial land uplift over New England and eastern Canada, as shown by the accompanying map.

On the small scale the map is, of course, somewhat generalized, but it is confidently believed to fairly represent the truth. The broken

1 "Pleistocene Marine Submergence of the Connecticut and Hudson Valleys," *Bull. Geol. Soc. Amer.*, Vol. 25, 1914, pp. 219–242.

"Pleistocene Uplift of New York and Adjacent Territory," *Bull. Geol. Soc. Amer.*, Vol. 27, 1916, pp. 235–262.

"Post-Glacial Marine Waters in Vermont," Report of Vermont State Geologist for 1915–16. pp. 1–41, 1917.

"Post-Glacial Submergence of Long Island," *Bull. Geol. Soc. Amer.*, Vol. 28, 1917, pp. 279–308.

"Post-Glacial Features of the Upper Hudson Valley," New York State Museum, Bull. No. 195, 1917.

lines are entirely hypothetic only in the Mississippi Valley, where there was probably some land uplift during the closing glacial epoch, the time of the Labradorian glacier. Except in the district west of Indiana and Michigan the map is intended to show only the Post-Wisconsin uplift, or the rise of the continent subsequent to the removal of the latest (Labradorian) ice sheet.

For Labrador and Newfoundland reliance is placed on the published figures of R. A. Daly, with some help from unpublished data of A. P. Coleman and J. B. Tyrrell.

Shoreline or beach features, bars and cliffs, are relatively uncommon at all stages of the uplifting, and rare at the primitive or summit plane of the sea-level waters, especially in far inland and secluded waters. For the above reason the main reliance in this study, especially when covering large territory in limited time, has not been placed on the uncertain open shore phenomena, but on the sure occurrence of deltas built by rivers debouching into the static waters. To avoid doubt or cavil as to glacial (ice-impounded) waters the main dependence has been on the deltas of streams with southward flow, or with flow directed away from the receding ice margin. To determine the true marine plane discrimination must be made between the sand plains which represent the initial sea level and the aggraded, coarse, upstream plains in the one hand, and the finer, submerged, downstream plains on the other hand. Where the valley stream deltas are heavy, with great horizontal extent and large vertical range, making more difficult the location of the primitive water plane, close determination of the latter is made by study of the deposits of small streams and other static-water features along the adjacent valley walls. Of course, the beach phenomena are utilized wherever possible, and especially on exposed coasts. In the extended paper, noted below, will be found a description of field methods, and a discussion of criteria for distinguishing marine features.

The map reveals strikingly the direct relation of the ice sheet to the diastrophic land movement; the area of uplift being the area of glaciation, and the amount of uplift being, apparently, in proportion to the relative thickness of the spreading ice cap. The map also shows the effect of land and sea on the flow and reach of the ice sheet. The ice deployed widely on the land, but was inhibited by the sea; thus producing more rapid flow and steeper gradients along the radii toward the nearer shores.

An independent ice cap over Newfoundland is indicated by the large local uplift.

The map also suggests that the correct name for this latest ice cap is not Labradorian but Quebecan; since the center of uplift, and presumedly the center of snow accumulation, lies between Quebec City and James Bay, while Labrador, proper, is only the narrow border of the so-called "Labrador peninsula."

For the details in this study, in both methods and results; for the description of features in western New England, Maine, St. Lawrence and Ottawa valleys, Gaspé peninsula, New Brunswick, Nova Scotia, Labrador and Newfoundland; and discussion of the possible effects of any change in ocean level, the reader is referred to the detailed paper, published in the *Bulletin* of the Geological Society of America, Vol. 29.

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THE AMERICAN PHILOSOPHICAL SOCIETY

THE general meeting was held in the hall of the society on Independence Square on April 18, 19 and 20. On the evening of April 19 there was a reception at the hall of the Historical Society of Pennsylvania, when Lieutenant Colonel Robert Andrews Millikan, Ph.D., Sc.D., of the department of science and research of the Council of National Defense spoke on "Science in relation to the war." At the annual dinner given at the University Club on the evening of April 20, the list of toasts was as follows:

"The memory of Franklin": Hon. David Jayne Hill.
"Our learned societies": George Ellery Hale.
"Our universities": Ethelbert D. Warfield.
"The American Philosophical Society": John C. DaCosta.